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# The Name of the Game: Applying Game Theory in Literature

HERBERT DE LEY

There has been no lack of general theorizing about games and their possible relationship to literature from Huizinga, to Fink, to Caillois. From the very beginnings of mathematical game theory in 1944 or earlier, it seemed likely that a system applicable to real decision-making and hypothetical scenarios—notably in the domain of nuclear strategy—might have application to fictional, literary decision-making and scenarios as well. In a landmark number of the *Yale French Studies* Jacques Ehrmann wrote that any theory of communication—and hence of literature—must necessarily imply “a theory of play . . . and a game theory.” Literary researchers, he concluded, would one day surely open a dialogue with “our colleagues in the sciences.” Moreover, any such *rapprochement* of literary research and the sciences would likely complement other systems that seek rigorously to describe narration. In particular, it might well relate to narrative semiotics—as a recent article by A. J. Greimas, reprinted in *SubStance*, implicitly suggests.<sup>1</sup>

Despite such theorizing however—and despite a number of applications of such writers as Caillois to literary works, there has been little application of mathematical game theory and related concepts to specific texts. More literally than is usually the case with such statements, the application of mathematical game theory to literature is a “neglected field.” The major and perhaps unique exception to this is a 1980 book by Steven J. Brams, *Biblical Games* (Cambridge: MIT Press, 1980). In *Biblical Games* Brams states that to the best of his knowledge “there has not previously been a book-length treatment of a humanistic or literary work that makes serious use of game theory”—a statement my own search would seem to confirm. Despite its remarkable originality, Brams’ work has apparently attracted little attention among students of critical methodology. Although favorably reviewed in *The New York Times*, it has not been reviewed in *SubStance* or, apparently, in any comparable journal. The *PMLA Bibliography* does not list it. Yet Brams’ pioneering method has application in a wide variety of literary studies. His emphases, his “blindness and insight,” so to speak, invite constructive comparison with those of game-oriented analysis

not linked to the theory of games, as well as to those of narrative semiotics—as the following pages will suggest.<sup>2</sup>

Brams feels obliged by the biblical text to limit severely the range of game-theory concepts he applies. He writes in his introduction that “I have eschewed cooperative game theory, cardinal utilities, and expected-value calculations because I think the Bible provides insufficient information to support applications of these concepts” (7). Brams does, however, use such game-theory notions as extended-form and normal-form matrices, games of partial and total conflict, dominant strategies, saddle points, and the like to analyse such “games” as Eve and the Serpent, Jacob and Esau, Joseph and his Brothers, the Judgment of Solomon, Saul and David, Esther and Ahasuerus, and Sampson and Delilah. However, his most numerous class of games is that in which God, having granted Man free will, proceeds to “play games” with humanity.

Brams’ most important innovation is his approach to the game-theory notion of payoffs and utilities. Like most narrative texts, the Bible furnishes little *quantitative* information about its personages’ preferences. Esther, for example, never states whether she fears the destruction of the Jews ten or a hundred or a thousand times more than she fears offending Ahasuerus. Von Neumann and Morganstern’s suggestion that in vague cases one can determine utilities by asking players if they prefer, say, a three-to-one chance at payoff A to an even chance at payoff B obviously cannot be applied. Brams resolves this problem by relying exclusively on *ordinal* utilities—that is, on simple rankings of preference. Even this presents some difficulties. As Brams points out, quoting Auerbach, “the Bible is spare in the details it offers of the thoughts and feelings of characters; stories often unroll with motives and purposes unexpressed.” Brams is thus occasionally led to fairly labored reasoning and leaps of faith. For example, he must reason a propos of Esther that:

Obviously, by interceding before the king, she was playing a risky strategy. But even if she lost and was killed by the king, she could not be faulted for not trying to save her people. Indeed, to them she would be a martyr, so I rate Esther’s unsuccessful intercession next best for her. . . (141).

Brams is fully aware of such problems and from time to time invites his readers to experiment—as game theoreticians themselves are fond of doing—with the implications of various payoff schemes. However, almost anyone could agree, as Brams invites his readers to agree, that Esther prefers interceding successfully and saving the Jews (Brams’ best preference—value 4) to interceding unsuccessfully and becoming a martyr (Brams’ second-best—value 3). In any case such reason—in part admittedly debatable and in part perfectly clear cut—allows Brams to determine normal-form game matrices like his figure 7.4 (adapted in Figure 1 here), one possible “Outcome matrix of Esther’s intercession” (141).<sup>3</sup>

Brams’ most striking conclusion is no doubt his view of the role of God in the biblical games He plays with Man. For, like the Proppian parents who give instructions to their children only to find them instantly disobeyed, Brams’ God also constantly sets conditions for mankind which mankind typically dis-

Figure 1. Outcome Matrix of the Game of Esther and Ahasuerus

		AHASUERUS	
		Stop Haman	Don't Stop Haman
ESTHER	Intercede	A. supportive, E. wins (4, 3)	A. unsupportive, E. martyred (3, 1)
	Don't Intercede	A. inconsistent, E. cowardly (2, 2)	A. untroubled, E. disgraced, killed (1, 4)

In (x, y), x = Esther's payoff; y = Ahasuerus' payoff  
 4 = best; 3 = next best; 2 = next worst; 1 = worst

regards. Of course, the trouble begins in the Garden of Eden. God sets out the rules of the game: eat anything but the tree of the knowledge of good and evil. And woman (and man) are immediately tempted and disobey. The trouble continues as God, through Moses, sets plague after plague on the Egyptians, even hardening the heart of Pharaoh, so he will not give in “too soon.” This state of affairs prompts considerable hand-wringing on Brams’ part—particularly since game theory posits *rational* players and Brams is at pains to prove that God is rational. He argues reasonably enough that Man, having received free will from God, is free to disobey if he chooses. He is also forced to wonder whether God—no longer omnipotent once He grants free will—may also no longer be omniscient either, failing to foresee Adam and Eve’s disobedience, or indeed the periodic restiveness of the Children of Israel. Brams, clearly disturbed by God’s occasional “treachery” toward Man, finally concludes that “this inimical behavior stems principally from His overweening concern for His reputation.” Perhaps anachronistically thinking about His “image,” writes Brams, “God continually broods about it. He worries endlessly about how to enhance it. He is not so much concerned with the world as how He thinks the world sees Him. He is other-directed with a vengeance” (173, 175).

It may be that in large measure Brams has difficulty with God and other biblical personages simply because the text he has chosen to analyse is, precisely, the Bible—a reputedly infallible, certainly sacred book. Although the Bible is more terse than many literary texts concerning the motivation of its personages, the veneration in which it is held by the faithful, its possibly overwhelming prestige suggests that its decisions must necessarily be the “rational” ones posited by game theory. Any game-theory exegete is thus required, sometimes, to reason mightily about the slim biblical evidence while working diligently to justify biblical personages and most especially, of course, God.

Actually, Brams’ very remarkably formulated and powerful method may be easier to apply to texts with less awesome implications and more explicit information on motivation. Moreover, just as Brams believes that some biblical sto-

ries lend themselves better than others to game-theory analysis, one might suppose that some literary domains, some genres, some epochs may also lend themselves better than others to analysis of this type. As a student of French literature reading *Brams* for the first time, I thought of a number of domains influenced by one or another formalism: the Grands Rhétoriciens, or the *blasons*, or the classicist plays of the Grand Siècle, or the *pièce bien faite* of the later nineteenth century, or the *conte* of the same period, or indeed the French New Novel. Each of these had previously struck me and others as functioning like one or another kind of puzzle—almost as a kind of *casier* or game board of possibilities, each one of which must be visited in the working out of any such “well-written” work.

The possibilities are numerous and can certainly not be exhausted in any one article, or series of articles, or books. In the following pages however I will sketch application of certain game-theory concepts to three examples: Corneille’s *Le Cid*, a *conte* by Maupassant recently studied in narrative semiotic terms by Greimas, and Alain Robbe-Grillet’s *L’Année dernière à Marienbad*.

A text like Corneille’s *Le Cid* might lend itself admirably to Greimasian or other narrative semiotic analysis; it would also lend itself admirably to analysis like that of *Brams*’ biblical stories. One might wish to model *Le Cid* as the circulation of an object of value—family honor or royal favor, perhaps—conquered by Don Rodrigue’s qualifying, decisive, and glorifying tests, and the like. However, one might also choose to model *Le Cid* as a series of decisions in which each personage’s choices are dependent on the previous choices of others—that is, like a game, according to the usual game-theory definition. Unlike some of *Brams*’ biblical stories, the text of *Le Cid* furnishes abundant information on its personages’ motivation and, consequently, on their ordinal preferences.<sup>4</sup>

Thus, *Le Cid* furnishes ample means to model, say, the Game of Choosing a Fiancé as played by Chimène and her father the Count or, in a different version, by the Infante. It also furnishes abundant information on the well-known Game of Love and Duty as played on three different occasions by Rodrigue and Chimène. In the first play of the Game of Love and Honor, Rodrigue’s ordering of preferences in his famous monologue at the end of Act One clearly gives him, in the game-theory term, a “dominant” strategy, i.e., a strategy avoiding the worst result (and possibly giving the best result) whatever may be done by the other player. Rodrigue’s dominant strategy, of course, is to prefer duty to love, whatever Chimène’s response may be, since this is the only strategy rendering him worthy of her continuing love and esteem. Chimène’s strategic options, moreover, are entirely symmetrical with Rodrigue’s, as she points out herself in the third act:

...le faisant [ton devoir], tu m’as appris le mien.  
 Ta funeste valeur m’instruit par ta victoire;  
 Elle a vengé ton père et soutenu ta gloire:  
 Même soin me regarde. . .

[ . . . by doing your duty you have taught me mine. Your fatal valor, through your victory, has taught me. It has avenged your father and sustained your glory. I have the same things to think about. . . ] (III, 4).

Thus in the first play of Rodrigue and Chimène’s Game of Love and Honor, each player has a dominant strategy: prefer honor to love in order to retain the esteem of the other. And, as must necessarily occur when both players have a dominant strategy, the Game of Rodrigue and Chimène has an equilibrium point or saddle point. In other words, the two dominant strategies chosen simultaneously give the players individually and collectively an optimum result.<sup>5</sup>

Rodrigue and Chimène’s game could no doubt be modeled in a variety of ways: as an extensive-form or normal-form game matrix. Yet, it is in any case somewhat different in subsequent plays of the game. As the two lovers re-play the game in Acts Three and Five, each has already ruled out the choice of love at the expense of duty. Rodrigue, for his part, has the consequent choice of accepting his adversarial role without comment, or trying some other approach. Meanwhile, Chimène must choose between accepting Rodrigue’s offer to let her kill him and pursuing Rodrigue through exclusively legal means. One possible normal-form game-theory model of their game in Acts Three and Five appears in Figure 2. As Figure 2 suggests, the modification of the choices modifies the payoffs. Indeed, it destroys the dominant strategies and saddle point enjoyed by the players in the first round.

**Figure 2. The Game of Rodrigue and Chimène: Second and Third Plays**

		CHIMENE	
		Legal Means	Voies De Fait (Anything Goes)
RODRIGUE	Accept An Adversary Role	(2, 1)	(3, 3)
	Communicate	(4, 4)	(1, 2)

As modeled in Figure 2, the Game of Rodrigue and Chimène becomes an example of a favorite, indeed fundamental problem of game theory, the Game of Prisoner’s Dilemma. In a sense “invented” to serve the theoretical needs of game theory by A. W. Tucker, the Game of Prisoner’s Dilemma posits that two criminals, accomplices in crime, are arrested and held without possibility of communicating with each other. Each criminal knows that if both remain silent, their individual and collective punishment will be relatively slight. However, each criminal also knows that if he informs on his accomplice his personal punishment will be diminished, and that conversely, if his accomplice confesses, his own punishment will be increased. The issues of “honor among thieves” and individual versus collective optimum solutions raised by the Game of Prisoner’s Dilemma have made it a classic game-theory problem.<sup>6</sup>

In the case of Rodrigue and Chimène, if each player plays “rationally” according to the matrix in Figure 2, Rodrigue will avoid the worst by accepting an adversarial role; Chimène will avoid the worst by choosing murder over legal means. But if each player chooses these “rational” strategies—rational according to time-honored notions of game theory—each will fail to achieve the

optimum, cooperative solution: legal means of pursuit and extra-adversarial initiatives. Rodrigue and Chimène are players of exemplary honor of course; their utilities are not the negative ones of years of prison, but degrees of honor and/or satisfaction. The structure of their dilemma, however, is the same as that of possibly less exemplary prisoners'. The comments of game-theoretician Morton D. Davis in *Game Theory on the Game of Prisoner's Dilemma* have remarkable applicability to the basic dilemma of *Le Cid*: "As a rule, when analyzing a game, one is content if one can say what rational players should do and predict what the outcome will be. But in the 'prisoner's dilemma' the uncooperative strategy is so unpalatable that the question most people try to answer is not: What strategy should a rational person choose? but: How can we justify playing a cooperative strategy (98)?"

Of course no such problem arises if the two "prisoners" can communicate with one another. Each one can know the other's choice and the collective advantage of cooperation can play its proper role. This is precisely what happens, of course, when Rodrigue confronts Chimène in Acts Three and Five, and it leads to the play's favorable outcome.<sup>7</sup> Therefore, Corneille's *Le Cid*—susceptible to modeling according to certain "favorite notions" of narrative semiotics—can also be modeled according to certain "favorite notions" of game theory, notably the Game of Prisoner's Dilemma, but with somewhat different results.

An even more striking comparison might result from game-theory analysis of a text like "Les Deux Amis" by Maupassant. The story is analyzed extensively in narrative semiotic terms by Greimas in his well-known *Maupassant*. In "Les Deux Amis," as Paris is besieged during the Franco-Prussian War, Monsieur Sauvage and Monsieur Morissot decide to leave the French defensive perimeter in order to go fishing in their former favorite fishing-spot, now located in No Man's Land. As they try to avoid the Prussian patrols, the two friends play a game "against nature"—more specifically, in this case, a game against the Prussians. The major factor is simply whatever random chance there may be that the Prussians will find them: a situation presenting little game-theoretic interest in the spare form presented in the story. After the Prussians do find them, however, the two friends find themselves playing an unpleasant game with the Prussian officer. He announces he will shoot them as spies unless they reveal the French password. They remain silent. The Prussian officer then takes Monsieur Morissot aside individually and asks again for the password, promising not to let the other know if he cooperates. When Monsieur Morissot still refuses, the officer makes the same offer to Monsieur Sauvage, who likewise remains silent. And, true to his word, the officer has them shot.

For Greimas, the Prussian's proposition represents the circulation of an object of value: the password. Greimas comes close to the game-theory distinction between payoffs and utilities when he remarks that "un objet quelconque peut être institué en objet de *vouloir*" ["any object may be considered an object of *desire*"] either for its own sake or because "sa possession peut être considérée comme souhaitable ou nécessaire en vue de la réalisation d'un autre PN pro-

jeté” [“its possession may be considered desirable or necessary with a view to realizing another projected narrative program”] (192). For Greimas the officer’s proposition is a “structure d’échange” [“a structure of exchange”], but one whose supposedly attractive aspects are actually an invitation to live a lie and a reminder of the unequal power relationship. The apparent exchange offer is actually a dilemma and an ultimatum. Greimas comes close to game theory again when he writes that the two friends’ choice is a “*décision* qui est un exercice de /pouvoir-faire/ situé sur la dimension cognitive” [“*decision* which is an exercise of the being-able-to-do on the cognitive dimension”] (200). The officer’s proposition tries to place the two friends in a position of being-unable-not-to-choose. However, because this choice is unattractive, “la négation de ce terme a pour résultat l’émergence de son terme contradictoire [sur le corré sémiotique], du /pouvoir ne pas faire/” [“the negation of this term has as its result the emergence of its contradictory term (in the semiotic table), that of being-able-not-to-do”] (207). The two friends do not divulge the password, and they are executed. Greimas does not use the word “game” in his analysis of this section of the story. He does observe, however, that “le véritable enjeu” is not giving or not giving the password, but the unequal power relationship itself. The decision is influenced in another way by a sender, the water that represents the liberty of the two fishing friends, and an anti-sender, the nearby artillery fire, a reminder of death. In the end the republican Sauvage and the anarchist Morissot do not divulge the password and are executed.<sup>8</sup>

Meanwhile, a student of game theory might model the Game of the Two Friends and the Prussian Officer in a variety of ways, depending on his assumptions. The officer, of course, presents it as a very simple zero-sum game: talk and go free or be silent and be shot. A more complex model reveals more about the situation, however. Presumably, the two friends’ first preference is to remain silent and nevertheless go free. This would have been the case if they had avoided capture, but that can happen now only if the Prussian changes his mind. In any case, as a first preference, it would have a value of four. As to their next preference, their earlier cynical comments about wars and governments suggest that they might prefer survival to patriotism. However, Monsieur Sauvage’s other earlier comment that the Prussians are worse than beasts—perhaps confirmed by the final outcome—suggests that when the chips are down those two friends might prefer death to helping the enemy (3). If for some reason they did have to reveal the password, presumably they would prefer to go free (2). Surely, their worst alternative would be to reveal their secret only to be shot anyway (1).

This last consideration raises the question of the Prussian officer’s sincerity, or in game-theoretical terms, of his corresponding strategic choices. One might argue that given the reputed bestiality of the Prussians, the officer’s first preference might be to learn the password and shoot the two friends anyway, possibly in order to prevent them from warning the French forces (4). This possibility does not at all seem to be suggested by the text, however. One might also argue plausibly that the Prussian, mindful of his honor as an officer, might prefer to learn the password and then keep his bargain (4? 3?). In any case, he



would presumably prefer to maintain credibility by shooting them if they do not talk (2). His worst alternative would be to let them remain silent and then free them anyway (1).

Since the two friends “play” first, their game may be represented appropriately as a  $2 \times 4$  game matrix (Figure 3). Figure 3 reveals that, as it turns out, the situation is not dependent on the sincerity of the Prussian. The two friends have a dominant strategy: don’t talk. This strategy gives them a better result than any they can hope for by talking, whatever the reaction of the Prussian might be. At the same time, despite his overwhelmingly superior power, the Prussian does not possess a dominant strategy: he is obliged to await their decision. However, the Prussian does possess the means for avoiding the worst. He can avoid *his* worst outcome either by shooting the two friends regardless of what they do or by treating them fairly (what Brams calls a tit-for-tat strategy). In either case his payoffs are the same. Thus the issue of the officer’s sincerity is, finally, irrelevant to the result and the text gives little or no information about it.

**Figure 3. The Prussian Officer’s Game**

		OFFICER			
		Shoot Regardless	Free Regardless	Talk-free, Don’t-shoot	Talk-shoot, Don’t-free
FRIENDS	Talk	(1, 4? 3?)	(2, 4? 3?)	(2, 4? 3?)	(1, 4? 3?)
	Don’t Talk	(3, 2)	(4, 1)	(3, 2)	(4, 1) — Dominant
		Maximum		Maximum	

Similarly, as long as the two friends’ utilities remain those outlined above, the officer’s attempts to play his game with each friend separately do not change the result either. Clearly, the Prussian hopes one or the other might be motivated negatively by possible disapproval of his own actions by his friend, or motivated positively to save both without apparent dishonor. But Maupassant’s text holds out little hope for this strategy. The friendship of Monsieur Morissot and Monsieur Sauvage is such that Greimas is led to view them as a dual subject; however, at the same time the title “Les Deux Amis” is ironic, since that friendship is characterized not so much by mutual affection as by identity of thought. Maupassant writes that Morissot and Sauvage “s’étaient pris d’amitié l’un pour l’autre” [“had become friends”], but he also writes that the two friends speak little and indeed understand each other admirably “sans rien dire, ayant des goûts semblables et des sensations identiques” [“without saying anything, having similar tastes and identical perceptions”]. When the officer plays his game with each friend separately, therefore, the utilities and payoffs remain the same.<sup>9</sup>

The Greimasian analysis sees the two friends as subject to forces exterior to themselves: they react against the superior force of the Prussian officer; they are influenced by the sender and anti-sender; their negation of the Prussian’s unattractive offer leads to the “emergence of its contradictory term” in the

semiotic table. In contrast, game theory subsumes these considerations in the ordering of players' utilities. It sees these players not as buffeted by fortune but as rational decision-makers in a specific situation. That situation, however, is that very specially-structured one embodied in the Game of the Prussian Officer: the precise context within which the players' decisions *become* rational. An example of this is the possibly puzzling but game-theory rational reaction of each friend as he plays the Game of the Prussian Officer separately, or indeed the reactions of the two friends together as they apparently defy overwhelming power, but also simply play the best (dominant) strategy available to them as they "make the best of a bad bargain."

Another example, as a kind of afterthought. When Alain Robbe-Grillet's *L'Année dernière à Marienbad* first appeared in 1961, there was considerable learned and other discussion of one of its recurring features, the "Marienbad Game." As is well known, the Marienbad Game is a variation on a simple ancient game often studied by game theoreticians: the Game of Nim. In *Marienbad* the husband-like figure M challenges all comers, stating that "Je peux perdre. . . . Mais je gagne toujours" ["I can lose. . . . But I always win"]. In the text M plays the Marienbad Game three times with his rival X, winning each time.<sup>10</sup>

Apparently, the definitive "explanation" of the Marienbad Game is Bruce Morrissette's appendix to *Les Romans de Robbe-Grillet*. In Nim one may prepare a given number of rows, each containing some given number of counters. Each player in turn removes one or more counters under some system of rules—one or two, one or more from any single row, or whatever. The person removing the last counter wins (or loses, according to whatever variant of the rules). In the particular form of Nim played in *Marienbad*, the rows contain one, three, five, and seven counters; each player removes one or more counters from a single row on each move, and the player taking the last counter loses. Using a method based on binary numbers, Morrissette shows (correctly, according to the theory of games) that each version of Nim is determinate. In other words, two players who understand the game's "system" must inevitably arrive at a predeterminable result. In most such games, the player who moves first is sure to win. In the particular variant played in *Marienbad*, however, the rational player who plays first must lose. Morrissette concludes that because the result is determined, "il ne s'agit nullement d'un vrai 'jeu', mais d'une certitude mathématique qui fait que la partie est toujours ou gagnée ou perdue d'avance" ["this is in no way a true 'game', but a mathematical certainty such that the game is always won or lost in advance"].<sup>11</sup>

In part because of this last remark, Morrissette's explanation—while game-oriented, apparently correct, and certainly suggestive—is not, strictly speaking, a game-theoretical explanation. As Anatole Rapoport writes, "What is the best way to play Chess?" is not a game-theoretical question." By the same token, "How to win at Nim" is not a game-theoretical question either. Rather, game theory studies the general conditions under which game strategies may be adopted as well as their results. It also regularly studies games whose results are pre-determined.<sup>12</sup>

Possibly the most fundamental achievement of game theory, one which has

influenced much if not most subsequent inquiry, is Von Neumann's "minimax theorem." The minimax theorem states that any and *all* two-person, finite, zero-sum games—whether the Marienbad Game, or Nim, or tic-tac-toe, or Checkers or Chess or whatever—have some "value" in representing what a rational player can hope to obtain as he plays against another rational player. In other words, all two-person, finite, zero-sum games have a determinate solution. The only difference between Nim and Chess is that Nim solutions are known and the Chess solution or solutions at present are unknown. For this reason, a student of the minimax would say that the Marienbad Game's determinate solution does not in any way mean it is not "a true game" or even that it is in any way unusual. Indeed, as a two-person, finite, zero-sum and hence determinate game, the Marienbad Game and its avatars represent the minimax case par excellence.<sup>13</sup>

Morrisette is somewhat closer to the game-theoretical approach in a 1968 *Yale French Studies* article in which he states that Nim "is not a 'game' in the open sense, but the execution of a predetermined certainty by one familiar with its system." Moreover, while the appendix draws no conclusions from its analysis of the game, Morrisette's later article addresses the place of the Marienbad Game in *Marienbad*. In this context the Marienbad Game is one among many examples of "interior duplication" of the film's "general pattern." In the film (or Robbe-Grillet's printed "ciné-roman"), X and M "confront each other in two ways: in the struggle of passion to possess A, and in the duel of the mind to win at Nim." For Morrisette the most striking feature of this contest is M's possession of a "system." The comments of the spectators—some correct and some not in the light of game-oriented and/or game theory analysis—"reflect the surrounding ignorance on which the power of M's play depends."<sup>14</sup>

What might game theory add to this? The game M and X play for the possession of A is, like Nim, a simple zero-sum game. The game X plays with A to persuade her to leave with him is more complex, but presumably one in which X has a dominant strategy. X has, so to speak, "nothing to lose." As for the Marienbad Game, the minimax theorem has already shown that its determinate character is not unusual. Morrisette's appendix has already shown that the Marienbad Game's value for the rational player moving first is -1: a loss. However, these facts throw an odd light on what Morrisette sees as the "power" of M's play, his ability to profit from the "surrounding ignorance" of the game. M, of course, could have chosen any one of a number of Nim variants whose value for the first player would be +1: a win. He could have chosen to play some game of another order whose determinate nature would be not necessarily guaranteed by the minimax or by game-theory attempts to extend the minimax to other classes of games. Instead, M has chosen to play a game whose minimax value for him is negative (he moves first in two out of three games in the printed version). Whatever M's ability to bluff, he has chosen a game in which the cards "are stacked against him."

In the printed text, M's "system" serves him perfectly: he wins all his matches against X. In the film version, as Morrisette points out, X wins a final match with M, foreshadowing his eventual "victory" with A. Morrisette

asks, “is it deliberately?” In game theory terms, however, this question is inappropriate. M has not entered an equal contest, winning at first but losing later. In game theory terms, M has chosen to play a game at which any rational player—or any player who *becomes* rational as he learns the game-system—can beat him. In the reality of game theory and as an “interior duplication” the Marienbad Game suggests that M’s loss of A is inevitable as the game is played repeatedly. And a student of game theory might ask whether this is the text’s commentary on long-standing companion relationships, that is, in the “Game of Marriage” and its variants, are the M figures inevitably, like the priest of the sacred wood in Frazer’s *Golden Bough*, destined to defeat? A question perhaps depending essentially on whether success in marriage is actually a zero-sum game with the world outside.<sup>15</sup>

Analysis like that applied to *Le Cid* could profitably be applied, of course, to a variety of Grand Siècle masterpieces, whether *Cinna*, or *Rodogune*, or *Le Misanthrope*, or some other. Analysis like that applied to “Les Deux Amis” could be applied to Feydeau, or Courteline, or the redoubtable Alphonse Daudet, or indeed to the earlier *Contes* of La Fontaine, recently studied in a semiotic light by Jane Merino-Morais. Analysis like that applied to *Marienbad* could be applied, of course, to other New Novels by Robbe-Grillet and others, but also to some earlier twentieth-century attempts at “combinatory” literature by Queneau and others. Because various texts offer differing types of information, certain texts may lend themselves to game-theory analysis using concepts not useful to Brams or to the present article. Thus one might apply a notion of cooperative game theory—the formation of coalitions—to works like *Bajazet* or *Béréenice*. The game-theory equivalent of intertextuality, “strategic equivalence,” might help compare Racine’s and Pradon’s *Phèdre*, or the Biblical and Racinian *Esther*, or the like.<sup>16</sup>

Neither proponents of narrative semiotics nor game theory can pretend, of course, to give a truly complete description of a given text. In his *Introduction à la sémiotique*, as he prepares to apply a Greimasian method to the story of Cinderella, J. Courtès inserts the phenomenologically obligatory disclaimer that “il s’agira ici d’une lecture sémiotique qui établit un niveau de pertinence parmi d’autres possibles: notre étude ne veut nullement dégager ‘le’ sens (qui serait définitif) du conte en question . . .” [“this is a matter of a semiotic reading which will establish a certain level of meaning among other possibilities; our study does not seek to show ‘the’ meaning (which would be the ‘definitive’ one) for the story in question . . .”]. In the same manner, as a veritable pioneer in the literary application of game theory, Brams acknowledges that “what I consider ‘natural’ others may consider at best strained, at worst contrived.” He adds that “I do not pretend to capture every nuance in a payoff matrix or game tree” (166). At the same time he writes that game theory analysis “opens up vistas” both “analytically by discriminating between motivational assumptions that work and do not work . . . [and] synthetically by providing a vocabulary and calculus that highlight common traits in different stories,” a statement confirmed by the preceding examples.<sup>17</sup>

As can also be seen from the preceding examples, those insights are complementary with those of narrative semiotics. Both methods find a repertoire of

common elements in plot summaries; both present players (or actants), decisive moments, punishments, and rewards within the context of a general conceptual scheme. The greatest difference between the two is no doubt the difference between the narrative semiotic notion of the hero and the game-theory notion of the (victorious) player. Typically unable to succeed without magic assistance and condemned to be wounded before triumph, the narrative semiotic hero may appear, rather literally, buffeted by fortune, a figure in the grip of forces greater than himself. The victorious player of game theory, however, seems to control his own destiny. Rather than studying things that happen *to* the players (except as they may change the conditions of the game), game theory focusses on the players' rational decisions. Even in games of imperfect information (frequent in literature), or games without dominant strategies (*Rodogune?* *La Jalousie?*), or games with negative payoffs (would this perhaps be a game-theoretical definition of tragedy?), the game-theoretical hero knows before he moves just what must be the value of his game and just what sort of payoff he may hope for.

Moreover, any such difference implies a different conception of the function of literature. With its emphasis on such motifs as testing, as magic help, as the error(s) and wounding of the hero and the like, narrative semiotic analysis may seem to suggest that literary works appeal to some possibly subconscious, possibly mystical, or Jungian, or Lévi-Straussian psychological itinerary. Game theory, however, insists on the rationality of players' choices. Any reader moved to tears of sorrow or joy by the sufferings of Messieurs Morissot and Sauvage, or the reconciliation of Rodrigue and Chimène may well prefer the relatively mysterious *épreuve* and wounded but finally triumphant hero to the apparent cool rationality of personages who—although ignorant of game theory—may appear to calculate their payoffs and utilities.

Actually, however, this difference may not be exactly what it first appears. Sauvage and Morissot, Rodrigue and Chimène are rational in game-theory terms, but only in the special context of the rather unusual and, perhaps, contrived games they play. However natural and pertinent the two friends' dilemma of survival and resistance to oppression may appear to readers of "Les Deux Amis," a great many stories by Maupassant and others show little or no interest in such topics. Obviously, the "name of the game" elsewhere is different. Similarly, generations of students have accepted as reasonable and natural Rodrigue and Chimène's preoccupation with love and duty. Yet while this issue is significantly widespread in seventeenth-century literature, as I have suggested elsewhere, numerous other Grand Siècle texts pay it little attention. In this way, presumably, the game-structure of literary texts may reproduce something like the "deep structure" of the semiotic square.<sup>18</sup>

As things stand now, game-theory literary analysis is essentially undeveloped, particularly in comparison with competing methods. If it develops further, it may be because of one possibly significant advantage. While narrative semiotics is surely, at least in the current state of things, a more powerful and more widely applicable method, it does possess one attribute often said to be undesirable in "scientific" explanation; it has been accused of being dispiritingly complex, complicated, even obfuscatory. It is not simple. One of the ad-

vantages of game theory, at least in this elementary stage, is its relative simplicity. Under some such inspiration Brams refers to the theory-of-science notion that "A good theory should be . . . relatively simple and easy to apply." For Brams, therefore, "this formalism, simple as it is, both summarizes a good deal in a story and highlights the central strategic choices of characters" (169). In the present article I have suggested (1) that Brams' conceptual repertoire can profitably be extended, (2) that literary domains not studied by Brams may provide more satisfying results, essentially because of differences in their own particular literary rationale, and (3) that game-theory analysis illuminates comparative narrative analyses of other, more powerful or more complicated kinds.

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#### NOTES

1. Bernard Suits writes, "there is a good deal of loose talk about games these days" (*The Grasshopper. Games, Life, and Utopia* [Toronto: Toronto UP, 1978] 152, quoted in Robert Rawdon Wilson, "Three Prolusions: Toward a Game Model of Literary Theory," *CRCL* 8 (1981), 79. Ehrmann, "Homo Ludens Revisited," 41 (1968) 56. Greimas, *SubStance* "About Games," 25 (1979) 31-35. Huizinga, J. *Homo Ludens*, trans. C. Seresia (Paris: Gallimard, 1951). Fink, Eugen, *Oase des Glücks. Gedanken zu einer Ontologie des Spiels* (Freiburg-Munich, 1957). Caillois, Roger, *Les Jeux et les hommes* (Paris: Gallimard, 1958). Von Neumann, John and Oskar Morganstern, *Theory of Games and Economic Behavior* (Princeton: Princeton UP, 1944).

2. Pp. 5-6. Brams references henceforth in text. Some un-game-theory but game-oriented applications are Patai, Daphne, "Gamesmanship and Anthrocentrism in Orwell's *1984*," *PMLA* 97 (1982), 856-70. Lévy, Sydney, *The Play of the Text. Max Jacob's Le Cornet à dés* (Madison: Wisconsin UP, 1981). Also Suits, Wilson, *YFS* cited above, etc. For earlier periods, see Aries, Philippe et al, eds., *Les Jeux à la Renaissance* (Paris: J. Vrin, 1982) and Centre Aixois d'Etudes sur le XVIIIe Siècle, *Le Jeu au XVIIIe siècle* (colloque 1971 [Aix: Edisud, 1976]). One rare attempt to apply mathematical game theory appears in Louis-Jean Calvet, *Les Jeux de la société* (Paris: Payot, 1978) 192-95. Meanwhile, the simplification of game theory for introductory purposes is in fact a much-honored tradition among game-theoreticians. Game theory, for some reason, seems to lend itself to popularization, whether for "hard" scientists, social scientists, economists, military people, or laymen. R. Duncan Luce and H. Raiffa, *Games and Decisions* (New York: J. Wiley, 1957) write that their book "attempts to communicate the central ideas and results of game theory . . . unencumbered by their technical mathematical details: thus, for example, almost no proofs are included" (vii). In one of a very few French treatises on the subject, Hervé Moulin writes that he will linger "plus longuement sur l'interprétation et la motivation des définitions proposées que sur les méthodes analytiques permettant de calculer tel ou tel équilibre," *Théorie des jeux pour l'économie et la politique* (Paris: Hermann, 1981) vii. See Morton D. Davis, *Game Theory* (New York: Basic, 1970) x-xi, xv.

3. R. B. Braithwaite questions the use of ordinal utilities as "not a strong enough premiss," *Theory of Games as a Tool for the Moral Philosopher* (Cambridge: Cambridge UP, 1963) 9. Braithwaite, in his own hypothetical (but narrative) examples, posits interval-scale values for his "players'" utilities. However, he is forced to indulge in the same type of conjecture as Brams about his players' motives.

4. Davis, 6-7. Anatole Rapoport, *Two-Person Game Theory* (Ann Arbor: Michigan UP, 1966) 16-21. Etc.

5. Rapoport, 59-62. Davis, 18-21. Etc.

6. Rapoport and Albert M. Chammah *Prisoner's Dilemma. A Study in Conflict and Cooperation* (Ann Arbor: Michigan UP, 1965). Davis, etc.
7. Davis, 113.
8. *Maupassant. La Sémiotique du texte. Exercices pratiques* (Paris: Seuil, 1976) 192, 195, 200, 207, 208.
9. Greimas, 13.
10. *Marienbad* (Paris: Minuit, 1961) 45.
11. *Romans de Robbe-Grillet* (Paris: Minuit, 1963) 244.
12. Rapoport, 14.
13. Davis, 38-50.
14. Morissette, "Games and Game Structures in Robbe-Grillet," *Yale French Studies* 41 (1968) 159, 165, 166.
15. *Ibid.*, 166.
16. Merino-Morais, *Différence et répétition dans les Contes de La Fontaine* (Gainesville: Florida UP, 1981). An example of game-theory-generated literature might be French game-theoretician Claude Berge's combinatorial poem, *La Reine aztèque ou contraintes pour un sonnet à longueur variable* (Paris [?]: Bibliothèque Oulipienne, 1983).
17. Paris: Hachette, 1976, 109.
18. De Ley, *The Movement of Thought. Essay on Intellect in Seventeenth-Century France* (Urbana: Illinois UP, 1985).